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Bruce

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(54) **ROOF-SCREEN SYSTEM**

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(52) **U.S. Cl.** **52/147**; 52/146; 52/710; 52/127.2; 135/94; 248/351; 256/12.5
(58) **Field of Search** 52/146, 147, 127.2, 52/710, 712–713; 135/91, 95, 94; 248/59, 62, 74.1–74.4, 351; 256/12.5; 403/52, 56, 57, 65, 330, 344

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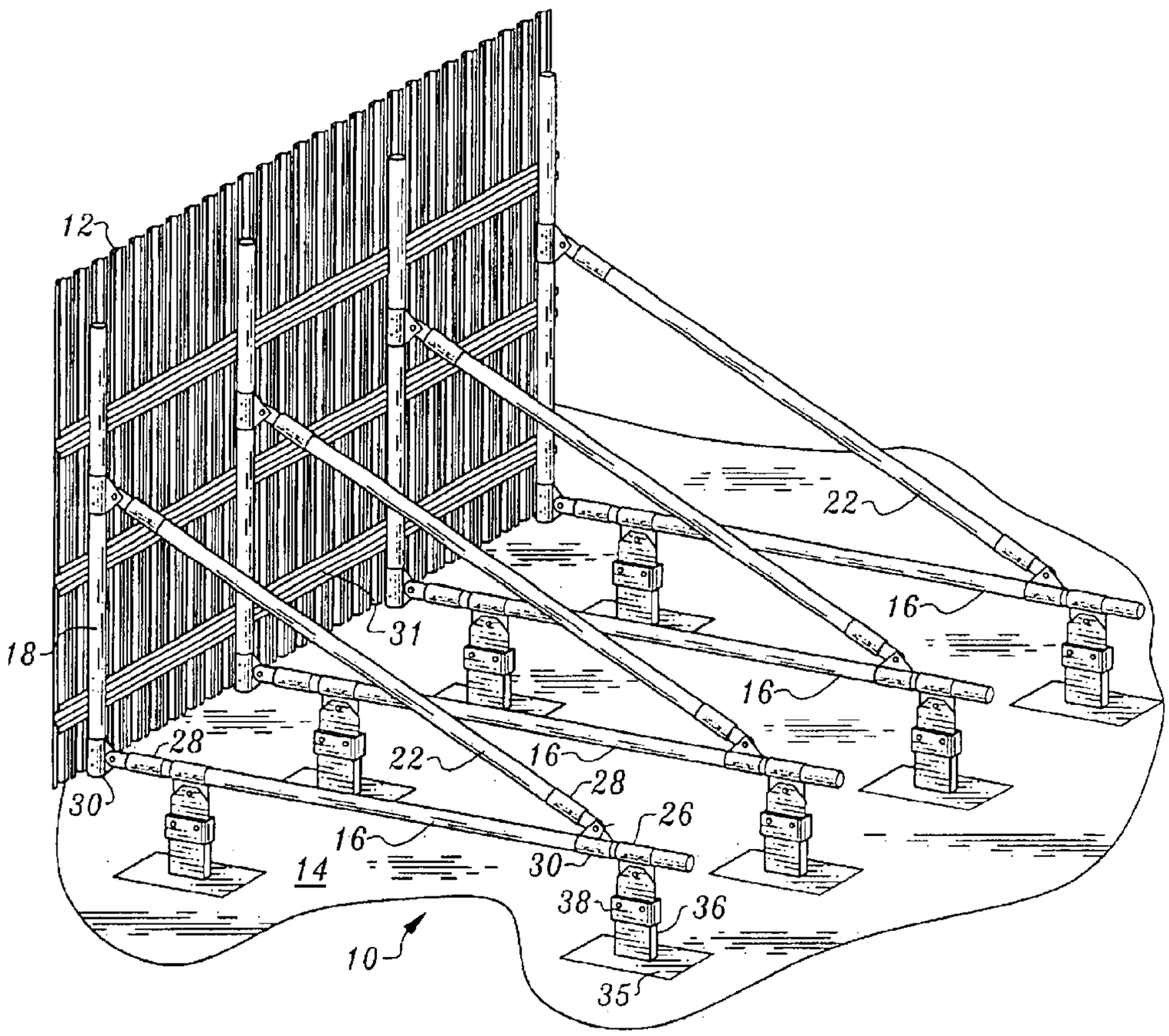
(57) **ABSTRACT**

A roof-screen system for supporting a roof screen on a roof, comprises a plurality of frame elements of round galvanized steel tubing configured as separate frames. The frames have a front element, a bottom element, and a diagonal brace element. A plurality of base supports are secured to the frame elements and sleeve connectors, including a base connector, an end connector, and a field connector which secure the frame elements together and to the base. A plurality of support elements are used for supporting the face panels to the front element of the separate frames.

40 Claims, 3 Drawing Sheets



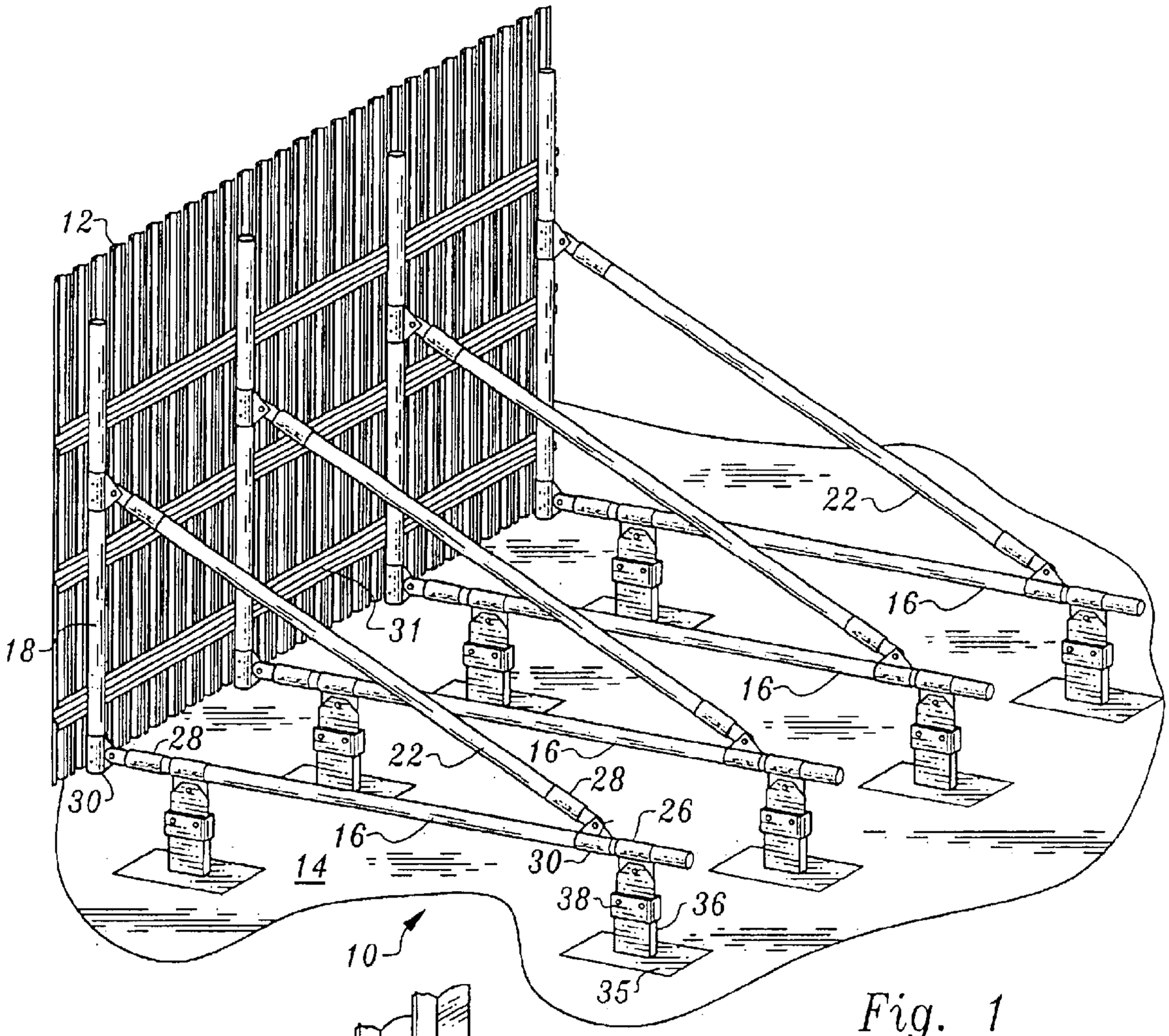

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Fig. 1

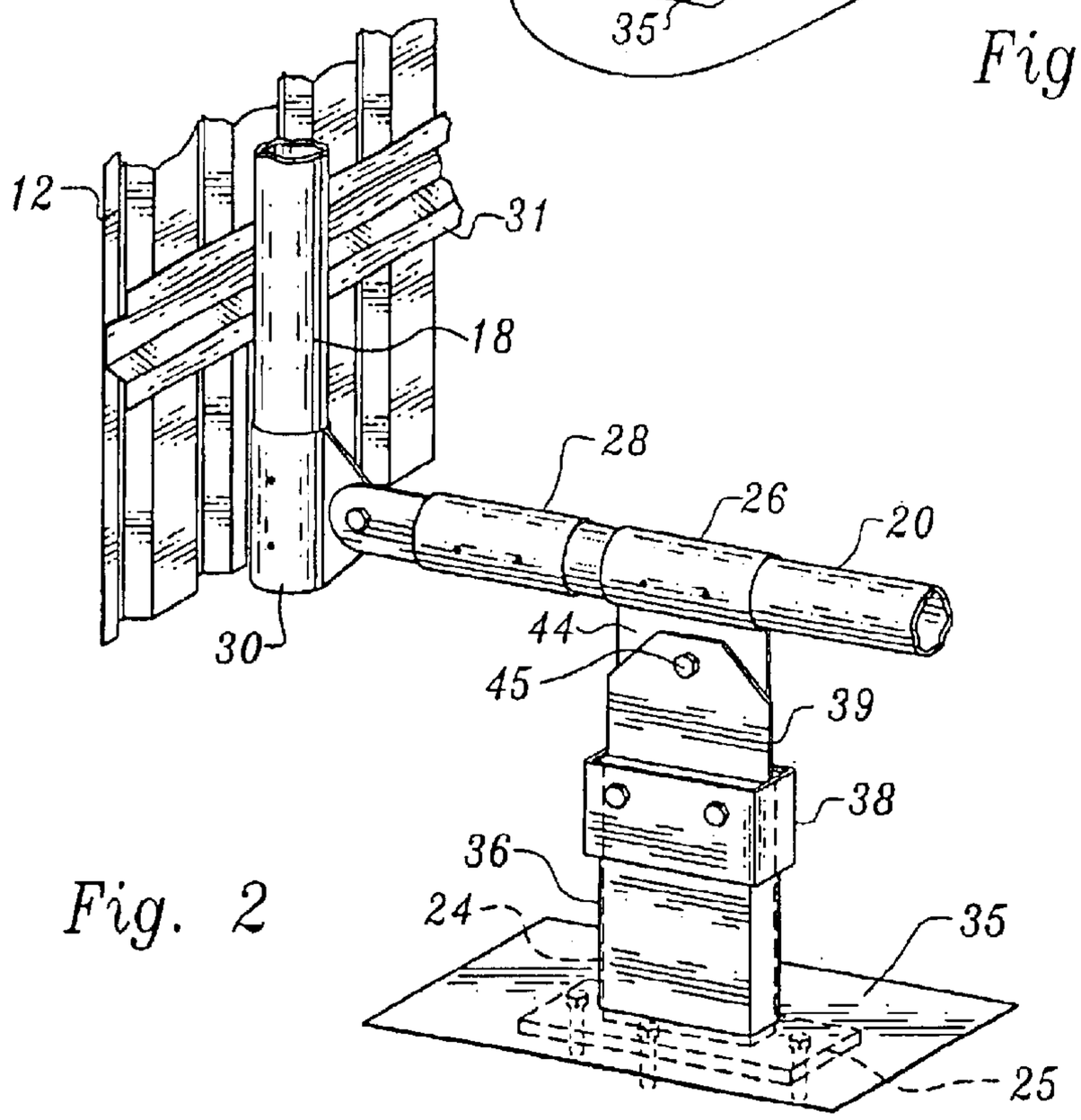
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Fig. 2

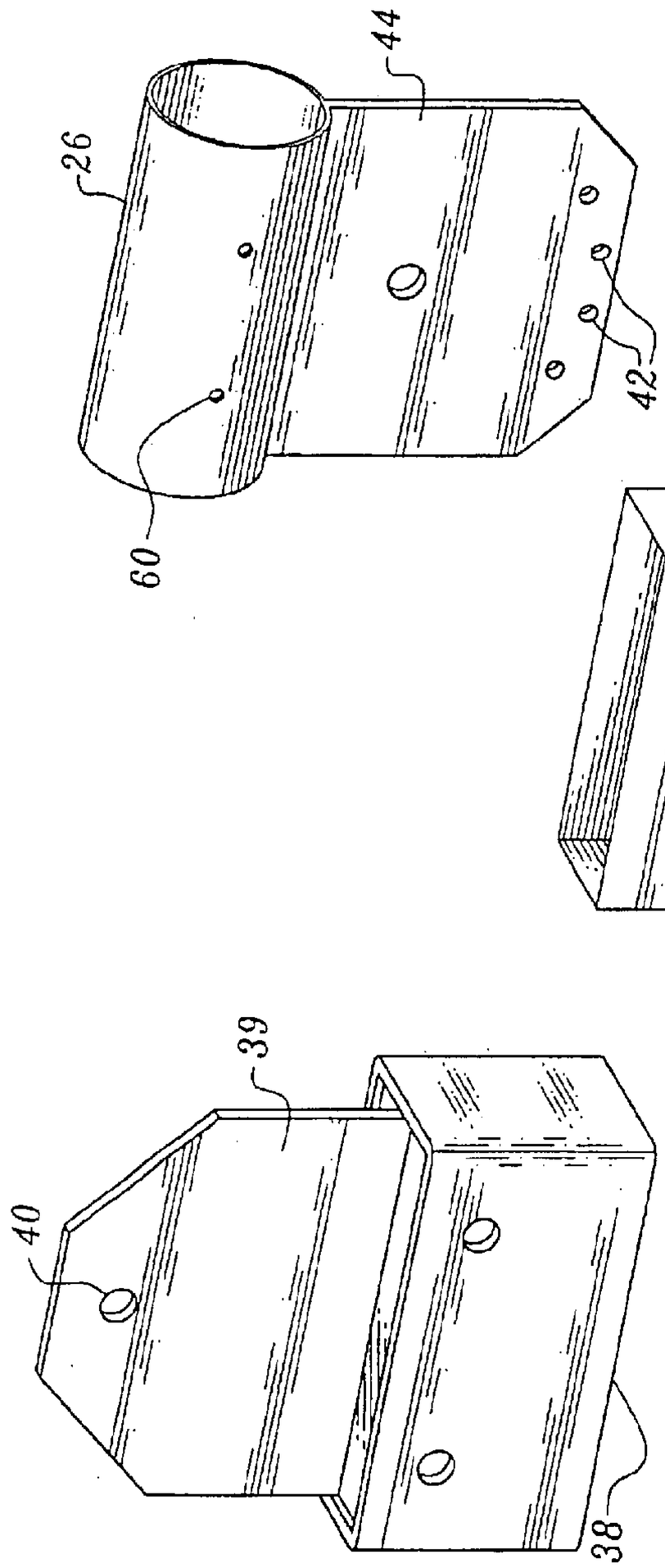

Fig. 6

Fig. 5

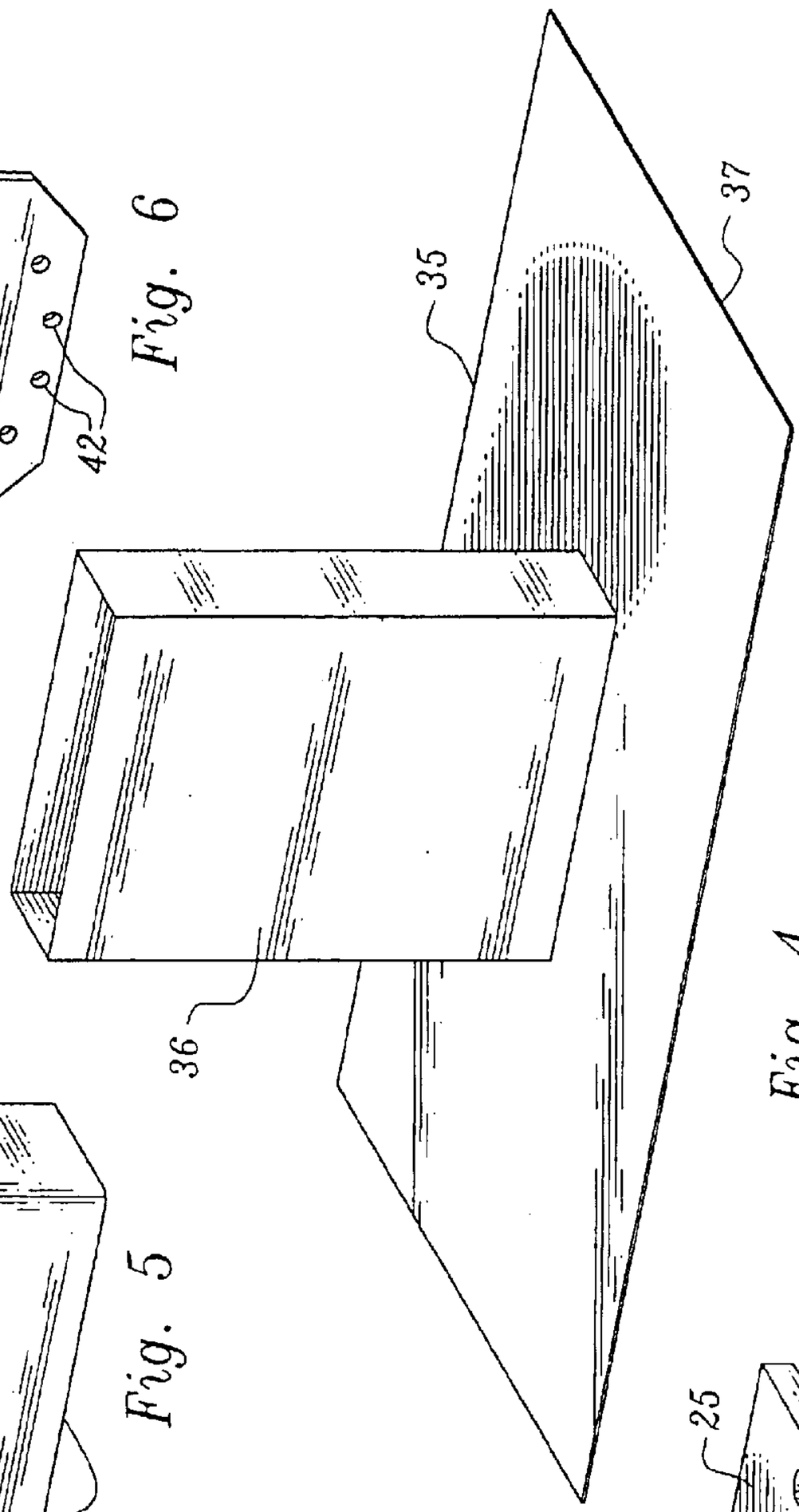

Fig. 4

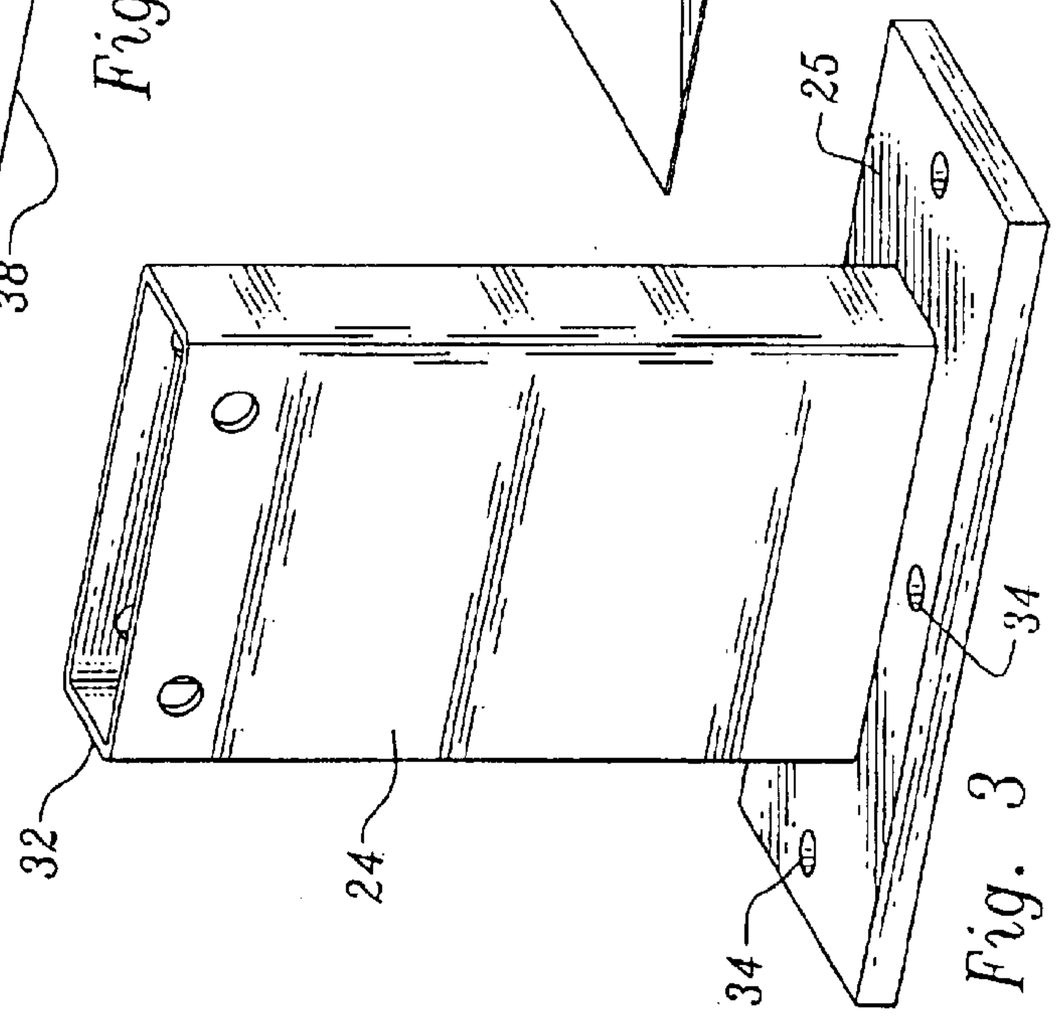

Fig. 3

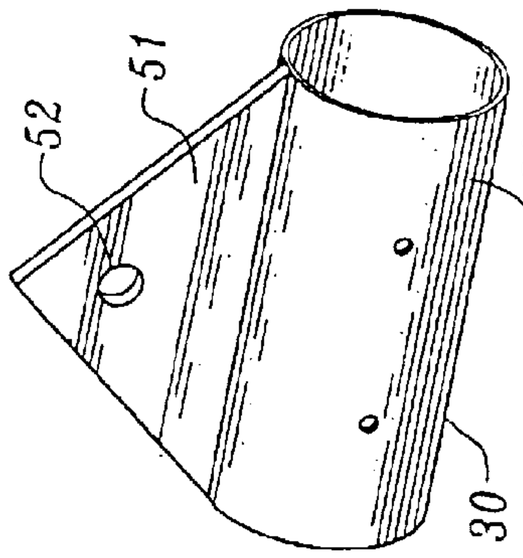

Fig. 8

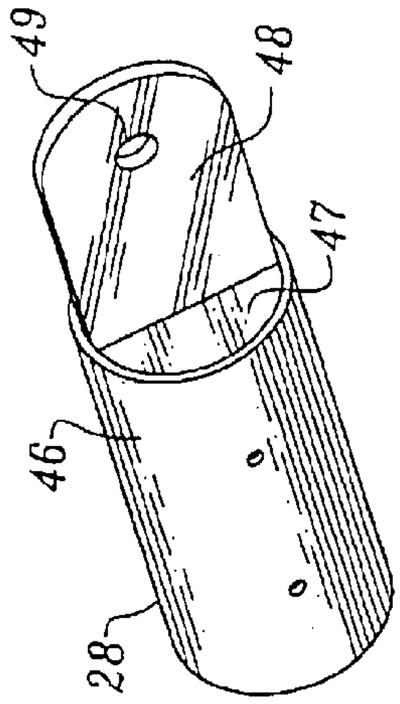

Fig. 7

Fig. 10

Fig. 9

ROOF-SCREEN SYSTEM

BACKGROUND OF THE INVENTION

1. Field of Invention

This invention relates to roof screens for use on the roof of a building for hiding or screening the roof top equipment such as air conditioners, ventilation equipment, pipes, electrical boxes, and more particularly to roof screens which are elevated on frames and base supports.

2. Description of the Related Art

Various roof screens have been proposed and implemented to hide or screen roof top equipment such as air conditioners, ventilation equipment, pipes, electrical boxes and the like. Such screens are also called mechanical screen walls, equipment screens, site screens, or screen walls. Traditional installations have used wooden "sleepers" bolted into the roof and wooden or sheet metal stud frames built on top of the wood sleepers. The panels usually used are either plywood or corrugated metal. A significant limitation of such systems is that the bolting of the sleepers through the roof causes roof leaks and damage.

Various methods and apparatuses have been proposed to improve on such systems. U.S. Pat. No. 5,862,637 issued Jan. 26, 1999 to Bruce, the inventor of the present invention, disclosed a steel system that is supported by round steel posts. This system greatly improved on the method of attachment to a roof, allowing watertight integrity of the attachment to the roof to be maintained. Such system used a heavy steel angle iron which was custom fit and welded in the field during installation.

Another patent issued to the present inventor, U.S. Pat. No. 6,205,719, issued to Bruce Mar. 27, 2001, disclosed a system which eliminates the field welding requirement. Such system used aluminum components which were adjustable in the field for a custom fit to the roof. Such system is very expensive to manufacture, and is vulnerable to vandalism for the recyclable aluminum. Such type of system is not as strong as the steel system, and has been limited by its expense.

Accordingly, it is the primary object of this invention to provide a roof screen system which is easy to install, inexpensive to manufacture, which may be manufactured and installed more quickly than any prior system, and does not face the risk of vandalism inherent in the aluminum systems.

Additional objects and advantages of the invention will be set forth in the description which follows, and in part will be obvious from the description, or may be learned by practice of the invention. The objects and advantages of the invention may be realized and obtained by means of the instrumentality's and combinations particularly pointed out in the appended claims.

SUMMARY OF THE INVENTION

To achieve the foregoing objects, and in accordance with the purpose of the invention as embodied and broadly described herein, a roof-screen system is provided including frame tubes of galvanized steel tubing. The tubing is configured in separate frames having a horizontal base, a vertical support, and a diagonal brace. These frames are preferably spaced according to the on-center spacing of the structural member of the roof framing system. The system is supported by steel "T" shaped base supports that are bolted into the structural frame elements. The frame tubes are held together by sliding sleeve connectors including, base connectors, end connectors and field connectors that telescope over the tube members. These sleeve connectors connect the frame tubes together while allowing adjustment in any direction during installation. Hat sections are installed horizontally across the series of frames, usually in two or three rows depending on wind loads and the height of the wall. The hat sections provide a mounting surface for the installation of the face panels.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate a preferred embodiment of the invention and, together with a general description given above and the detailed description of the preferred embodiment given below, serve to explain the principles of the invention.

FIG. **1** is a perspective view a roof screen system, according to the invention.

FIG. **2** is a view of a base support with a bottom element and front element secured thereto, according to the invention.

FIG. **3**, is a view of a base support, according to the invention.

FIG. **4**, is a view of a base flashing, according to the invention.

FIG. **5** is a view of a base cap, according to the invention.

FIG. **6** is a view of a base connector sleeve, according to the invention.

FIG. **7** is a view of an end connector, according to the invention.

FIG. **8** is a view of a field connector, according to the invention.

FIG. **9** is a view of an alternative embodiment of a base support, according to the invention.

FIG. **10** is an alternative embodiment of a base flashing, according to the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference will now be made in detail to the present preferred embodiments of the invention as illustrated in the accompanying drawings.

In accordance with the present invention, there is provided in a preferred embodiment of the invention, a roof-screen system for supporting a roof screen on a roof, having a plurality of frame elements of round galvanized steel tubing configured as separate frames. The frames have a front element, a bottom element, and a diagonal brace element. A plurality of base supports are secured to the frame elements, and sleeve connectors, including a base connector, an end connector, and a field connector which secure the frame elements together and to the base. A plurality of support elements are used for supporting the face panels to the front element of the separate frames.

In FIG. **1**, the roof-screen system **10**, is shown according to a preferred embodiment of the invention. Roof-screen system **10**, for supporting a roof screen **12**, on a roof **14**, comprises a plurality of frame elements **16**, preferably composed of round galvanized steel tubing, or other durable resilient material. The plurality of frame elements are configured as separate frames each having a front element **18**, a bottom element **20**, and a diagonal brace element **22**.

A plurality of base supports **24**, are operably secured to the bottom frame elements **20**, as seen in FIGS. **1** and **2**.

Sleeve connector means which preferably are base connectors **26**, end connectors **28**, and field connectors **30**, are used to connect the plurality of frame elements together and the base supports together.

A plurality of support means, preferably hat sections **31**, which are elongated rail supports, are used to provide a mounting surface for face panels of roof screen **12**. Preferably hat sections **31**, are installed horizontally across the plurality of frames, typically using two or three rows depending on wind loads and the height of the wall, and may be screwed or bolted or otherwise affixed to front frame element **18**. The face panels **12**, may be provided in a variety of styles, colors, and finishes as desired, and may be varied to meet wind loads and attachment methods.

With reference now to FIG. **3**, base support **24** is shown, and is preferably composed of steel. Rectangular shaped tube **32** may be welded to base plate **25** or other fastening means. The thickness and dimensions of base support **24** may be changed depending upon wind loads and particular site features, as may be the particular placing and spacing of bolt holes **34**.

In FIG. **4**, base flashing **35** with riser **36** and base **37** is shown. The inside dimension of riser **36** is slightly larger than the outside dimension of rectangular tube **32** of the base support **24**. Base **37** is preferably about 4 inches larger than the base plate **25** of base support **24**, but may be provided in other sizes as well. Base flashing **35** is slipped over base support **24**, preferably after base support **24** is installed and bolted to the roof. Base flashing **35** provides weather protection and is preferred, however, it may be omitted in alternative embodiments.

As seen in FIG. **5**, base cap **38** is preferably composed of steel or other durable material, and is sized to slip over base support **24** and base flashing **35**, so as to provide weather protection for the top of base flashing **35** as well as a mounting bracket for base connector **26**, seen in FIG. **6**. Preferably, the body of base cap **38** is fabricated from a piece of rectangular tubing large enough to telescope over riser **32**, on base support **24**, but leaving enough clearance for base flashing **35** between base support **24** and base cap **38**. Base cap **38** preferably counter-flashes over base support **24** and base flashing **35** allowing holes in base cap **38** to align with holes in base support **24** to receive bolts that extend through base cap **38** and base support **24**. Preferably the main body of base cap **38** has a welded plate, forming a water tight end cap and providing a welding surface for fin plate **39**, which is the bracket for mounting base connector **26**. Fin plate **39**, may be provided with pre-punched holes for pivot bolt **40**, so as to allow base connector **26** to pivot in conditions where the base supports **24** are not perpendicular to frame elements **16**. Preferably the corners of fin plate **39** are beveled to allow for clearance of base connector **26** in conditions where it must pivot.

With reference now to FIG. **6**, base connector **26** is shown, preferably including a tubing with fin plate **44** welded thereto. The tubing is sized to telescope over frame elements **16**, allowing for unlimited adjustments during installation. Base connector **26** is preferably composed of steel or other durable material and may include pre-punched pilot holes **60** to receive screws, such as self drilling tek type screws. After field adjustments are made by sliding base connectors **26** on frame elements **16** as necessary, the screws are installed, ultimately providing a permanent connection between base connector **26** and frame elements **16**. Preferably, fin plate **44** is provided with pre-punched holes to receive the pivot bolt **45**, that secures base cap **38** to base connector **26**. Fin plate **44**, may be provided with pre-punched holes **42** arranged at a radius from the center of the pivot bolt, or otherwise as desired. These holes guide screws to secure fin **39** of base cap **38**, to fin **44** of base connector **26** after pivoting adjustments have been made, so as to provide a fixed connection between base supports **24** and bottom frame tube **20**.

In FIG. **7**, end connector **28** is shown with tube **46** sized to telescope over the frame elements and end cap **47**, preferably welded to tube **46** to provide a welding surface for fin arm **48**. Fin arm **48** is preferably provided with a pre-punched aperture **49** for a pivot bolt. End connector **28** is installed on the end of a frame element to provide means of connecting the end of the frame element to a field connector **30**. Aperture **49**, in the fin arm of end connector **28** is aligned with the aperture in the fin of field connector **30** and preferably is secured by a pivot bolt. Tube **46** of end connector **28** may be provided with pre-punched apertures to receive screws. After field adjustments are made by twisting the end connectors on the frame elements **16** as necessary, the screws are installed, providing a permanent connection between the end connectors **28** and the frame elements **16**.

With reference now to FIG. **8**, field connector **30** is shown with tube portion **50**, fin **51**, and aperture **52** for a pivot bolt. Tube portion **50**, is preferably sized to telescope over the frame tubing allowing for unlimited adjustments during installation, and may be provided with pre-punched apertures to received securing screws or bolts. After field adjustments have been made by sliding field connectors **30** on the frame tubes as necessary, screws are installed providing for a permanent connection between the field connector and the frame tube. Fin **51** may also be provided with aperture **52** for a pivot bolt that mates field connector **30** with end connector **28**.

In FIG. **9**, an alternative embodiment of a base support is shown. Base support **53** comprises a rectangular plate **54** preferably welded to a flat base plate with aperture **55** for receiving a pivot bolt. The thickness and dimensions of this base support may be varied depending upon wind loads and installation environment.

In FIG. **10**, an alternative embodiment of the base flashing is shown. Base flashing **56** is provided with a rectangular riser **57** preferably soldered to a flat base **58**. In this embodiment, the base flashing is preferably composed of a soft lead or similar material. The base flashing slips over the base support after the base support is installed and bolted to the roof. At the upper portion of riser **57**, are radius wedges **59**, soldered to riser **57**. These wedges provide a surface for a clamping band to tighten around the base flashing drawing the soft lead tightly to the steel plate riser of the base support.

In operation and use, the roof-screen system of the present invention is easy and quick to install, reliable, efficient, is less expensive to manufacture than prior systems, and may use material that is less at risk of vandalism than prior systems.

Additional advantages and modification will readily occur to those skilled in the art. The invention in its broader aspects is, therefore, not limited to the specific details, representative apparatus and illustrative examples shown and described. Accordingly, departures from such details may be made without departing from the spirit or scope of the applicant's general inventive concept.

What is claimed is:

1. A roof-screen system for supporting a roof screen on a roof, comprising:

a frame including a front element, a bottom element, and a diagonal element;

a base support;

a connector having a telescoping element which telescopes over said bottom element and means for connecting said telescoping element to said base support which means is in fixed relation with said telescoping element;

sleeve connector means for connecting said front, bottom and diagonal elements; and

a support means for supporting a face panel to said front element.

2. The roof-screen system of claim **1** wherein said telescoping element is tubular.

3. The roof-screen assembly of claim **1** wherein said telescoping element is in fixed relation with said base support.

4. The roof-screen assembly of claim **1** wherein means for connecting said telescoping element to said base support is in fixed relation with said base support.

5. The roof-screen assembly of claim **1** wherein said frame elements are steel.

6. The roof-screen assembly of claim **1** wherein said frame elements are tubular.

7. The roof screen assembly of claim **1** wherein said frame elements are round galvanized steel tubing.

8. The roof screen assembly of claim **1** wherein said frame elements form a triangular frame.

9. The roof-screen assembly of claim **1** wherein said base support is operably secured to a roof.

10. The roof-screen assembly of claim **1** wherein said support means is horizontally positioned.

11. A roof-screen system for supporting a roof screen on a roof, comprising:

a frame including a front element, a bottom element, and a diagonal element;

a base support;

a connector having a telescoping element which telescopes over said bottom element and a plate extending from said telescoping element, said plate being connectable to said base support;

sleeve connector means for connecting said front, bottom and diagonal elements; and

a support means for supporting a face panel to said front element.

12. The roof-screen assembly of claim **11** wherein said plate is welded to said telescoping element.

13. The roof-screen system of claim **11** wherein said telescoping element is tubular.

14. The roof-screen assembly of claim **11** wherein said plate is in fixed relation with said telescoping element.

15. The roof-screen assembly of claim **11** wherein said plate is in fixed relation with said base support.

16. The roof-screen assembly of claim **11** wherein said telescoping element is in fixed relation with said base support.

17. The roof screen assembly of claim **11** wherein said plate includes a hole for connecting said connector to said base support.

18. The roof-screen assembly of claim **11** wherein said frame elements are steel.

19. The roof-screen assembly of claim **11** wherein said frame elements are tubular.

20. The roof screen assembly of claim **11** wherein said frame elements are round galvanized steel tubing.

21. The roof screen assembly of claim **11** wherein said frame elements form a triangular frame.

22. The roof-screen assembly of claim **11** wherein said base support is operably secured to a roof.

23. The roof-screen assembly of claim **11** wherein said support means is horizontally positioned.

24. The roof-screen assembly of claim **11** wherein said plate is connectable to said base support by a base cap telescoping over said base support and a second plate extending from said base cap, said plate and said second plate being securable to one another to connect said bottom element and said base support.

25. The roof-screen assembly of claim **24** wherein said two plates are in fixed relation to one another.

26. A roof-screen system for supporting a roof screen on a roof, comprising:

a frame including a front element, a bottom element, and a diagonal element;

a base support operably secured to said bottom element;

connector means including a first connector having a first telescoping element telescoping over one of said frame elements and a first plate extending from said first telescoping element and a second connector having a second telescoping element telescoping over another of said frame elements and a second plate extending from said second telescoping element, said first and second plates being securable to one another to connect one of said frame elements and the other of said frame elements; and

a support means for supporting a face panel to said front element.

27. The roof-screen system of claim **26** wherein one of said frame elements is said front element and the other of said frame elements is said bottom element.

28. The roof-screen system of claim **26** wherein one of said frame elements is said front element and the other of said frame elements is said diagonal element.

29. The roof-screen system of claim **26** wherein one of said frame elements is said diagonal element and the other of said frame elements is said bottom element.

30. The roof screen assembly of claim **26** wherein said first and second plates are in fixed relation with said first and second telescoping elements, respectively.

31. The roof-screen assembly of claim **26** wherein said first and second plates are welded to said first and second telescoping elements, respectively.

32. The roof-screen assembly of claim **26** wherein said first plate includes a first hole and said second plate includes a second hole, said first and second holes alignable for securing said first and second plates.

33. The roof screen system of claim **26** wherein said first and second telescoping elements are tubular.

34. The roof screen assembly of claim **26** wherein said frame elements form a triangular frame.

35. The roof-screen assembly of claim **26** wherein said base support is operably secured to a roof.

36. The roof-screen assembly of claim **26** wherein said support means is horizontally positioned.

37. The roof-screen assembly of claim **26** wherein said frame elements are steel.

38. The roof-screen assembly of claim **26** wherein said frame elements are tubular.

39. The roof screen assembly of claim **26** wherein said frame elements are round galvanized steel tubing.

40. A roof-screen system for supporting a roof screen on a roof, comprising:

a frame including a front element, a bottom element, and a diagonal element;

a base support;

a connector having a telescoping element which telescopes over said bottom element and means for connecting said telescoping element to said base support which means is in fixed relation with said telescoping element, wherein said means for connecting said telescoping element to said base support is welded to said telescoping element;

sleeve connector means for connecting said front, bottom and diagonal elements; and

a support means for supporting a face panel to said front element.

* * * * *